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D'APPOLONIA CONSULTING ENGINEERS PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. HOWELLS RUN DAM (ID NUMBER PA --ETC(U)
JUN 78

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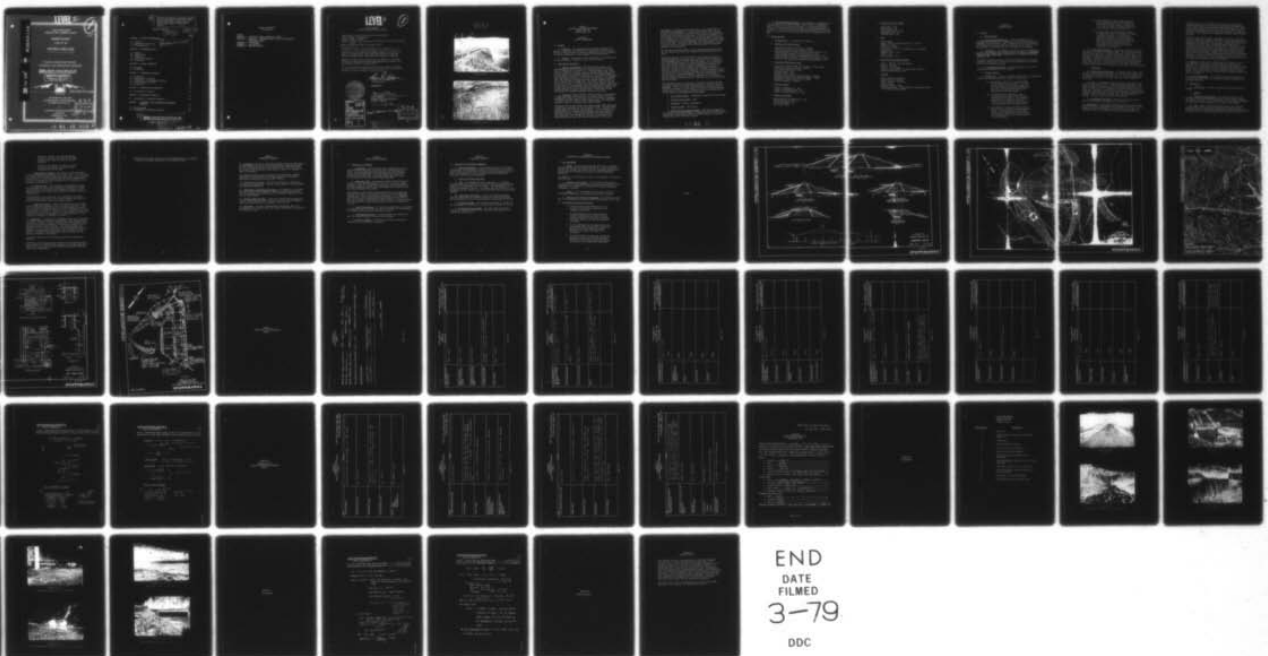
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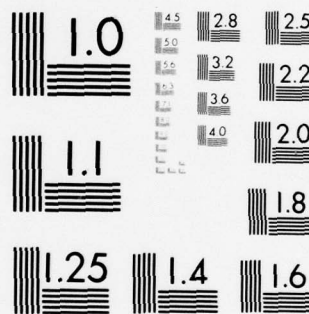
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LEVEL II



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HOWELLS RUN, CAMBRIA COUNTY

PENNSYLVANIA

ID NO. PA. 434

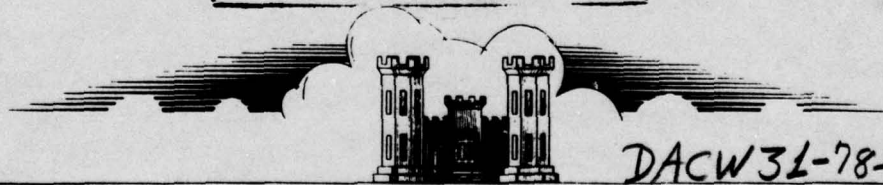
2 HOWELLS RUN DAM
CID Number PA 434

4 PHASE I INSPECTION REPORT
1 NATIONAL DAM INSPECTION PROGRAM,

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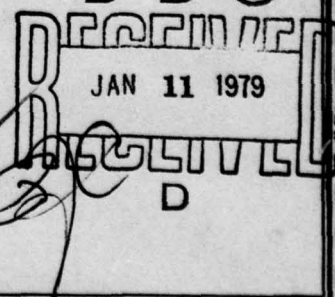
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235
JUNE 1978

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National Dam Inspection Program. Howells Run Dam (ID Number PA 434), Ohio River Basin, Howells Run, Cambria County, Pennsylvania. Phase I Inspection Report.

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LEVEL ¹¹

①

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Howells Run Dam (New City Reservoir)
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Cambria
STREAM: Howells Run, tributary of North Branch of Little Conemaugh River

DATE OF INSPECTION: (May 16 and 30, 1978)

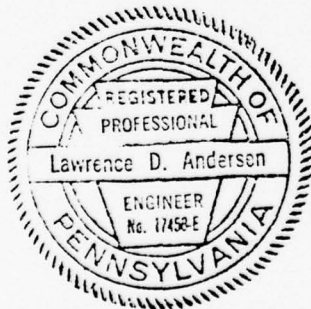
ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection and as revealed by visual observations, the condition of Howells Run Dam is assessed to be good. The spillway has the recommended capacity to pass the probable maximum flood. Therefore, the spillway is adequate.

Operation of the outlet pipe gate was not observed. The owner reports that the gate has never been operated and therefore its operational condition is questionable.

It is recommended that the owner monitor the uncontrolled seeps on each side of the spillway channel and take necessary remedial measures if seeps are found to be increasing.

Lawrence D. Andersen

Lawrence D. Andersen, P.E.
Vice President



APPROVED BY:

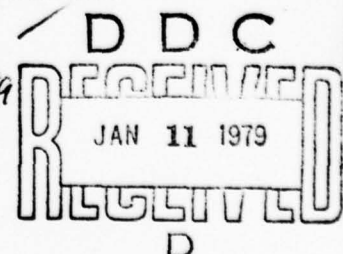
G. K. Withers

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 6 Jul 78

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HOWELLS RUN DAM
NDS I.D. NO. 434
MAY 16, 1978



Upstream Face



Downstream Face

PHASE I
NATIONAL DAM INSPECTION PROGRAM
HOWELLS RUN DAM
NDS I.D. NO. 434

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. Howells Run Dam consists of an earth embankment 670 feet long with a maximum height of 63 feet from the downstream toe. (Plate 1). → A 50-foot-wide concrete chute spillway located on the right abutment (looking downstream) serves as both primary and emergency spillway for the reservoir. (Plate 2). Flow through the spillway is controlled by an ogee weir at Elevation 2050 (USGS Datum) which is 8 feet below the dam crest at Elevation 2058. The spillway discharges into the concrete channel which in turn discharges into a plunge pool. The outlet works for the dam consist of a 5-foot by 5.5-foot horseshoe outlet conduit located left of the center of the embankment and a 16-inch cast-iron supply line. In 1964, the outlet conduit was extended approximately 150 feet by 60-inch-diameter reinforced concrete pipe. This outlet system constitutes the emergency drawdown facility for the dam. (cont on p. iii)

b. Location. Howells Run Dam, which is known to the Borough of Ebensburg as New City Reservoir, is located (Plate 3) at the headwaters of Howells Run, 1/2 mile north of the town of Ebensburg in Cambria Township, Cambria County, Pennsylvania. The impounded reservoir serves as a domestic water supply source.

Downstream from the dam, Howells Run flows through three reservoirs located over a distance of one mile below the dam. The first downstream reservoir is the Old City Reservoir. It is retained by an approximately 15-foot-high earth embankment and stores about 60 acre-feet of water. This dam has a 56-foot-wide concrete-lined chute spillway. Flow through the spillway is controlled by a broad-crested weir three feet below the dam crest. The second

impoundment is locally known as Lake Jenks. It is retained by a four-foot-high embankment. A 150-foot-long masonry wall, the top of which is located about four feet below the top of the embankment, constitutes the spillway for the lake. The reservoir appears to be very shallow and it is estimated that the stored volume of water is in the range of 5 to 10 acre-feet. The third reservoir, Lake Rowena, is also retained by an earth embankment, approximately 300 feet long and 12 feet high. An 80-foot-wide ogee weir, approximately 7 feet below the dam crest, serves as the combined primary and emergency spillway for the reservoir.

The city water treatment plant located immediately downstream from Old City Reservoir is the first structure in the Howells Run flood plain.

Downstream from the Old City Reservoir, the stream flows under a railroad embankment, into Lake Jenks, and then under another railroad embankment before flowing into Lake Rowena. It is estimated that the discharge capacity of the Old City Reservoir spillway and the culvert under the first railroad embankment is significantly less than the full spillway capacity of the Howells Run Dam. Therefore, continued full discharge from the Howells Run Dam is likely to overtop the Old City Reservoir, form an impoundment behind the 20-foot-high first railroad embankment, and subsequently overtop and breach this railroad embankment. The two 9-foot-diameter culverts through the second railroad embankment are considered to have sufficient discharge capacity to pass the full flow from Howells Run Dam spillway.

The main impact area of a flood due to failure of Howells Run Dam is located upstream from Lake Rowena and below the second railroad embankment. This area includes approximately 15 homes and several commercial buildings. In the event of a failure of Howells Run Dam, further life loss and property damage may occur in the areas west of Lake Rowena and downstream from Lake Rowena.

- c. Size Classification. Intermediate (based on 63-foot height).
- d. Hazard Classification. High.
- e. Ownership. Borough of Ebensburg.
- f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was designed by L. R. Kimball Consulting Engineers of Ebensburg, Pennsylvania in 1961. The dam was constructed by Frank M. Sheesley Company of Johnstown, Pennsylvania, with completion in 1964.

h. Normal Operating Procedure. The reservoir is maintained at the spillway crest, Elevation 2050, leaving 8 feet of freeboard to the low section on the crest of the dam. All flow occurring when pool is at or above the spillway elevation is discharged through the spillway. It was reported by water company personnel that the outlet pipe for the dam has never been operated since the completion of the dam.

1.3 Pertinent Data

a. Drainage Area - 1.4 square miles (Plate 3)

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - Unknown
Warm water outlet at pool elevation - N/A
Diversion tunnel low pool outlet at pool elevation - 355
Gated spillway capacity at pool elevation - N/A
Gated spillway capacity at maximum pool elevation - N/A
Ungated spillway capacity at maximum pool elevation - 2750
Total spillway capacity at maximum pool elevation - 2750

c. Elevation (USGS Datum) (feet)

Top of dam - 2058 to 2060 (the dam has a 2-foot crown)
Maximum pool-design surcharge - 2055.7
Full flood control pool - N/A
Recreation pool - N/A
Spillway crest - 2050
Upstream portal invert diversion tunnel - Unknown
Downstream portal invert diversion tunnel - 1997+
Streambed at center line of dam - 1995+
Maximum tailwater - Unknown

d. Reservoir (feet)

Length of maximum pool - 5400
Length of recreation pool - N/A
Length of flood control pool - N/A

e. Storage (acre-feet)

Recreation pool (normal pool) - 1324
Flood control pool - N/A
Design surcharge - 752
Top of dam - 2076

f. Reservoir Surface (acres)

Top of dam - 121+
Maximum pool - N/A
Flood control pool - N/A
Recreation pool - N/A
Spillway crest - 82

g. Dam

Type - Earth
Length (crest excluding spillway) - 670 feet
Height - 64 feet
Top width - 20 feet
Side slopes - 2.5:1, 3:1 downstream; 3:1 upstream
Zoning - Yes
Impervious core - Yes
Cutoff - Yes
Grout curtain - Yes

h. Diversion and Regulating Tunnel

Type - 5 feet by 5 feet horseshoe
Length - 330 feet
Closure - Sluice gate
Access - Gate controls at intake tower (Plate 4)
Regulating Facilities - Yes

i. Spillway

Type - Ogee chute spillway
Length of weir - 50 feet
Crest elevation - 2050 feet
Gates - None.
Upstream channel - Lake
Downstream channel - Discharging to trapezoidal channel
with 20-foot bottom width

SECTION 2 ENGINEERING DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A report prepared by the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER), dated February 7, 1961, summarizes most of the hydrologic and hydraulic design data which are available for the project. The report states the criteria used for the design of the spillway.

(2) Embankment. The embankment design is based on Engineering Report on the Proposed Water Supply Dam for the Borough of Ebensburg, Cambria County, Pennsylvania, prepared by L. R. Kimball, Consulting Engineers, 1961.

The report includes results of geologic reconnaissance of the site, subsurface exploration, laboratory testing programs, and recommendations for the embankment design.

(3) Appurtenant Structures. Structural design data for the appurtenant structures were not available.

b. Design Features

(1) Embankment. A review of design drawings and the engineering report shows the following main features of the project:

- (a) As designed, the dam is a zoned embankment with an impervious core section. In the design drawing, two zones were identified: (1) select impervious material forming the core; and (2) random fill, forming the downstream and upstream slopes.
- (b) The embankment was designed to have a constant upstream slope of three to one (horizontal to vertical). The downstream slope is 2.5 to 1 from the crest to a 10-foot bench at Elevation 2035 and three to one below the bench to the toe level.
- (c) The impervious core was designed to have a maximum width of 98 feet at the foundation level. At the upstream toe of the core section, core material was extended down to the foundation rock level to form a cutoff for the embankment.

- (d) Design included a grout curtain extending to a maximum depth of 60 feet below the bottom of the cutoff trench. Grouting was to be done in zones 20 feet deep using the split spacing, stage grouting method.
- (e) A three-foot-thick filter blanket beneath the downstream slope was provided to control the phreatic surface. The filter was designed to consist of a two-foot-thick layer of coarse gravel with six inches of sand both below and above the gravel layer. The filter blanket originated 65 feet downstream from the axis of the dam and terminated at the rock toe.

(2) Appurtenant Structures. Appurtenant structures for the dam consist of spillway and outlet works. The spillway structures consist of an ogee weir, spillway chute, and stilling basin. The uncontrolled ogee weir is located at Elevation 2050. The base of the weir is extended to bedrock. The chute section consists of a rectangular concrete channel varying in width from 50 feet at the ogee crest to 20 feet, 120 feet below the crest and then constant below this point to the stilling basin. The design specified grouted anchor bars to tie the chute spillway slabs to the foundation.

c. Design Data

(1) Hydrology and Hydraulics. The PennDER report states that according to the criteria in effect at the time of the design, the spillway was required to pass 1850 cfs. It is further stated that the spillway is capable of passing this flow with a freeboard of three feet.

(2) Dam. The embankment design was based on the geology and soils report prepared by L. R. Kimball Consulting Engineers. The report includes a description of the subsurface conditions and the types of laboratory tests conducted on the foundation and borrow materials. The report states that the safety factor of the upstream slope was calculated to be 1.55 for rapid drawdown conditions using strength values of 850 psf cohesion and a friction angle of 10 degrees. No other stability analysis was reported.

(3) Appurtenant Structures. There are no design values or calculations available for appurtenant structures.

2.2 Construction. Construction drawings and various construction progress reports and photographs were available for review. To the extent that can be determined, the construction of the dam was apparently conducted according to the design specifications. No

reference was found to indicate that any unusual problems were encountered during the construction, except during the excavation of the cutoff trench where various crevices were uncovered. These crevices were located 75 feet to the left of the outlet conduit. They were approximately one-foot wide and extended over a distance of 20 feet. The crevices were capped with concrete slabs and later grouted.

In 1964, immediately following completion of the dam, a landslide occurred on the left abutment. The slide was approximately 150 feet long and 40 feet high from the toe level. Significant seepage was observed in the slide area. Remedial measures consisted of extending the outlet conduit by 150 feet and placing a sand filter and earth-fill buttress against the slide area. Seepage from the slide area was collected into the drainpipe discharging into the outlet pipe stilling basin. Seepage from the area was monitored over a period of 125 days following the completion of the corrective measures. A similar treatment consisting of filter and earth-fill buttress was also used to correct a seepage and slumping area on the left side of the spillway in the natural ground.

2.3 Operation. There are no formal operating records available for this dam. As designed, the dam serves as a water supply reservoir. The supply water from the reservoir discharges through a 16-inch pipe, controlled by manually operated valves located at the intake tower. The drainpipe is also controlled from the intake tower. It discharges into the stream through a channel located near the left abutment.

2.4 Other Investigations. The available information indicates no investigations other than the infrequent periodic inspections conducted by the state.

2.5 Evaluation

a. Availability. Available engineering data was provided by PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. The reported results of the hydrology and hydraulic analysis indicate that the design followed the criteria set forth by the Commonwealth of Pennsylvania, Department of Forests and Waters, applicable at the time of the design.

(2) Dam. Review of the geotechnical aspects of the design indicates that although the design generally followed currently accepted practice for subsurface investigations and laboratory testing, it appears that the stability analysis was conducted for only one

condition: upstream slope rapid drawdown. No seepage analysis was found in the design report.

(3) Appurtenant Structures. Review of design drawings indicates that as designed there are no significant design deficiencies that should affect the overall performance of the appurtenant structures.

c. Operating Records. No formal operating records are available for the dam. Water company personnel reported that there was no need to operate the drainpipe sluice gate in the past, therefore to the best of their knowledge, it has never been operated since completion of the dam.

d. Post-Construction Changes. Immediately following the completion of the dam in 1964, a landslide was observed on the left abutment. The extent of repair measures taken at the time is described in Section 2.2.

e. Seismic Stability. The dam is located in Seismic Zone 1 and static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is assumed to present no hazard from earthquakes.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Howells Run Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.
2. Visual examination of spillway and its components, the downstream end of the outlet pipe, and other appurtenant features.
3. Observation factors affecting the runoff potential of the drainage basin.
4. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 5 and in the photographs in Appendix C.

b. Dam. The general inspection of the dam consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

1. Two concentrated seeps were observed on the natural ground located on each side of the spillway chute. The flow from the right side seepage was estimated to be two to three gallons per minute (gpm). The left side seepage was estimated to be one gpm. These seeps are not considered to be affecting the overall performance of the embankment, however, they should be closely observed to assure that they are not increasing.
2. Various wet areas were observed along the bench on the downstream slope of the dam. No perceivable amount of water was discharging from these areas.
3. The crest elevation along a 100-foot section immediately adjacent to the spillway was found to be one to two feet below the crest

elevation. Review of the design drawings indicates that this condition was the result of camber built into the crest of the dam (Plate 1).

4. High grass and patches of brush were found to impair the adequate inspection of the downstream face of the dam.

c. Appurtenant Structures. The spillway crests and plunge pools were examined for deterioration of the concrete or other signs of distress and obstructions that would limit flow. These structures were found to be in good condition and performing satisfactorily. As can be determined from the downstream end, the condition of the drainpipe is considered good.

d. Reservoir Area. The watershed is predominantly covered with woodlands and infiltration capacity is estimated to be good. There appeared to be no major land clearing activities or other operations that would significantly increase the runoff rate of the drainage basin.

The shorelines are not considered to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displaced water.

e. Downstream Channel. Howells Run downstream from the dam flows through three reservoirs over a distance of one mile. There are two railroad embankments across the stream within this reach. The reservoirs and culverts below the railroad embankments are shown in Photographs 7 through 12. Sketches of the reservoir spillway and culverts are included in Appendix A. Further description of the downstream condition is included in Section 1.

3.2 Evaluation. In general, the condition of the dam is considered to be good. Review of PennDER correspondence files indicates that the seepage condition along the spillway chute was previously noted (1964) and the owner was advised to evaluate the condition and to undertake necessary repair measures. The seepage problem was evaluated by F. T. Kitlinski and Associates, Consulting Foundation Engineers, of Harrisburg, Pennsylvania, and was found to be not serious. Subsequent flow measurements taken indicated that the seepage was gradually decreasing.

The present condition of this seepage problem is considered not serious.

Various wet areas observed along the bench on the downstream slope do not appear to be affecting the stability of the downstream face. These areas in the future should be monitored to assure continued safety of the embankment.

Clearing of high grass and brush from the downstream face is required to facilitate adequate inspection of the downstream face.

SECTION 4 OPERATIONAL FEATURES

4.1 Procedures. Review of the design drawings and field observations indicates that there are no formal procedures for operating the dam. The only operational feature of the dam which may affect the safety of the dam is the outlet pipe sluice gate, in case it is required to lower the reservoir.

The clearing of debris from the spillway as required and continued inspection of the facilities by the dam tender are the principal maintenance operations which would affect safety.

4.2 Maintenance of the Dam. The overall maintenance conditions of the dam appear satisfactory. However, annual mowing of the downstream face should be instituted.

4.3 Maintenance of Operating Facilities. The operation of the outlet pipe sluice gate was not observed. Borough personnel reported that the gate has never been operated and the functional condition of the gate was questionable.

4.4 Warning System in Effect. There is no formal warning system in effect. The dam tender does not reside at the site and no permanent communication facilities are available at the dam site.

4.5 Evaluation. The dam is satisfactorily maintained, and it is considered to be accessible under all weather conditions for inspection and emergency action.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Howells Run Dam has a watershed area of 1.4 square miles and impounds a reservoir with a surface area of 84 acres. A 50-foot-wide spillway constitutes the flood discharge system for the impoundment. The flow through the spillway is controlled by an ogee weir at Elevation 2050, eight feet below the low section of the dam crest at Elevation 2058.

b. Experience Data. As previously stated, Howells Run Dam is classified to be an "intermediate" size dam in the "high" hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass the probable maximum flood (PMF).

The adequacy of the spillway was analyzed based on the simplified procedure developed by the Baltimore District, Corps of Engineers (Appendix D). Based on this analysis procedure, it was determined that the PMF inflow hydrograph would have a peak flow of 2660 cfs and a total volume of approximately 3500 acre-feet. It was calculated that the spillway can pass the peak PMF inflow with a freeboard of 1.6 feet.

c. Visual Observations. On the date of inspection, no conditions were observed which would indicate that the spillway of the dam could not operate satisfactorily in the event of flood.

d. Overtopping Potential. As stated above, the spillway can pass the peak PMF without the dam being overtopped.

e. Spillway Adequacy. The spillway can pass the peak PMF, therefore, it is classified as adequate.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam and none were reported in the past after completion of repair measures for the landslide that occurred in 1964 on the left abutment.

b. Design and Construction Data

(1) Dam. The engineering report prepared by L. R. Kimball Consulting Engineers includes the results of rapid drawdown stability analysis for the upstream face of the dam. The minimum factor of safety was reported to be 1.55. It appears that the stability of the embankment was not analyzed for other conditions, such as steady-state seepage.

(2) Appurtenant Structures. Review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of appurtenant structures.

c. Operating Records. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. Post-Construction Changes. The repair measures taken to correct the landslide condition that existed in 1964 appear to be performing satisfactorily.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety. The visual observations and review of available information indicate that Howells Run Dam is in good condition. It appears that the dam was constructed with reasonable care and the design generally followed the currently accepted engineering practices.

The capacity of the spillway was found to be "adequate" to pass the peak PMF flow.

b. Adequacy of Information. The available information in conjunction with visual observations and previous experience of the inspectors are considered to be sufficient to make a reasonable assessment of the dam.

c. Urgency. The recommendations listed below should be implemented immediately or as soon as practicable, as noted.

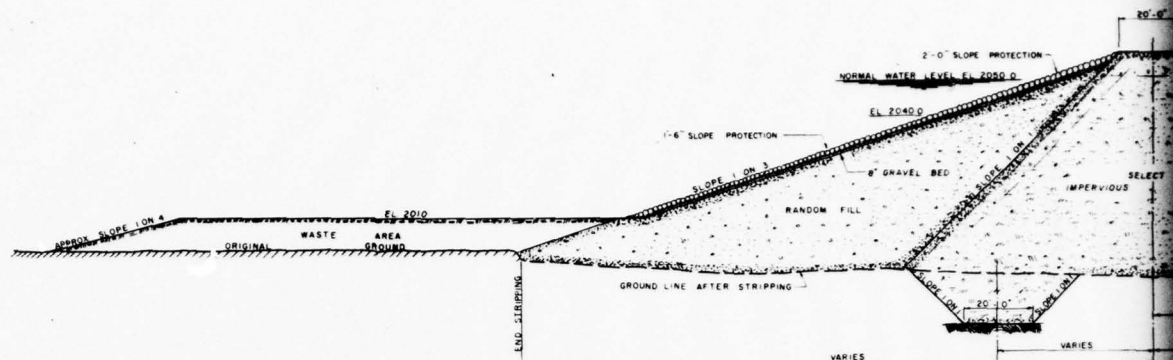
d. Necessity for Further Investigation. The condition of the dam is not considered to require further investigation at this time.

7.2 Recommendations/Remedial Measures

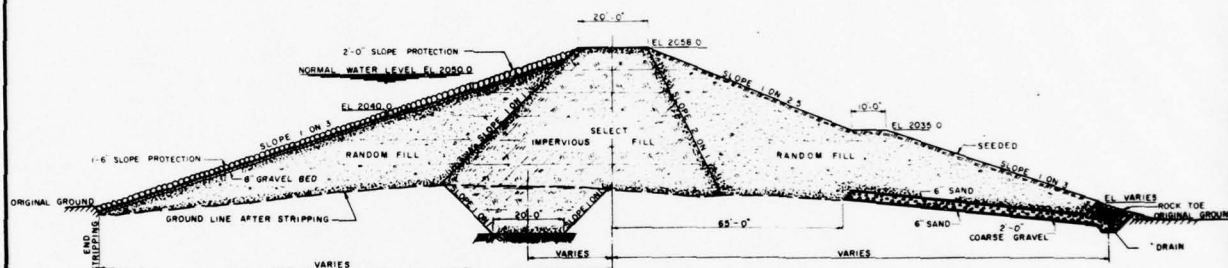
1. The owner should take immediate action to evaluate the operational condition of the drainpipe sluice gate.
2. The downstream face of the dam should be cleared of high grass and brush to permit adequate inspection of the face of the dam and annual mowing of the dam face should be instituted.
3. It is recommended that the owner monitor the uncontrolled seeps on each side of the spillway channel and take necessary remedial measures if the seeps are found to be increasing.
4. The owner should be advised that the dam and appurtenant structures should be inspected regularly and any unusual conditions should be reported to the appropriate authorities.

PLATES

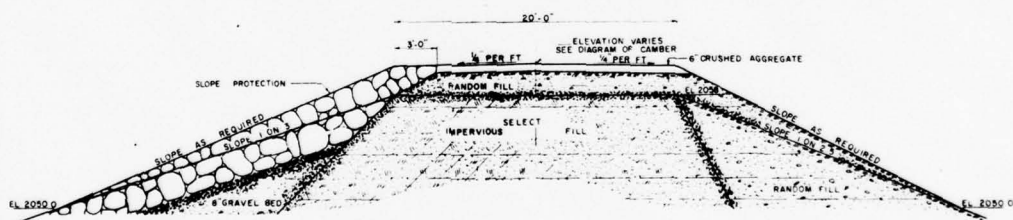
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BY	5-25-78	APPROVED BY	JHP		



TYPICAL CROSS SECTION
STATION 5+60D TO
SCALE 1"=20'



TYPICAL CROSS SECTION
STATION 4+50D TO STATION 5+60D
SCALE 1"=20'



CREST OF DAM CROSS SECTION
SCALE 1"=5'

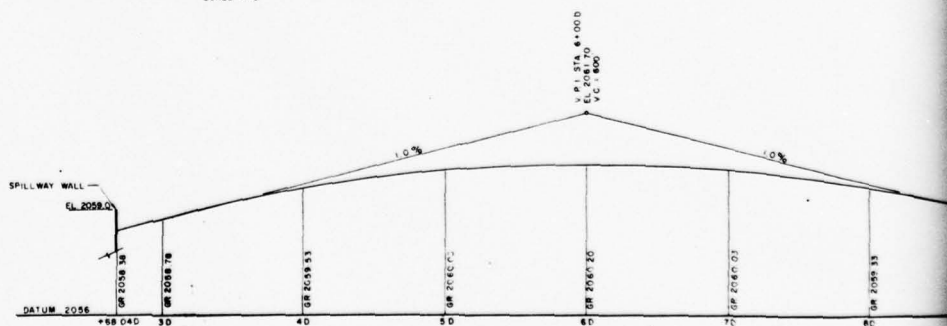
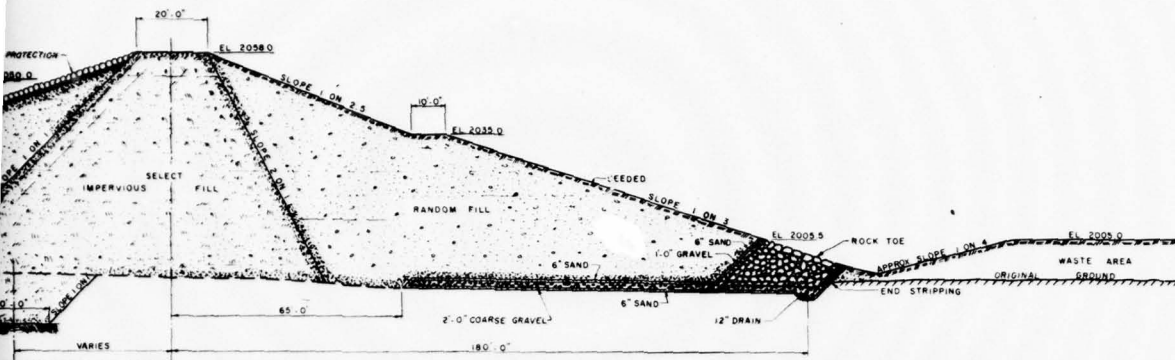
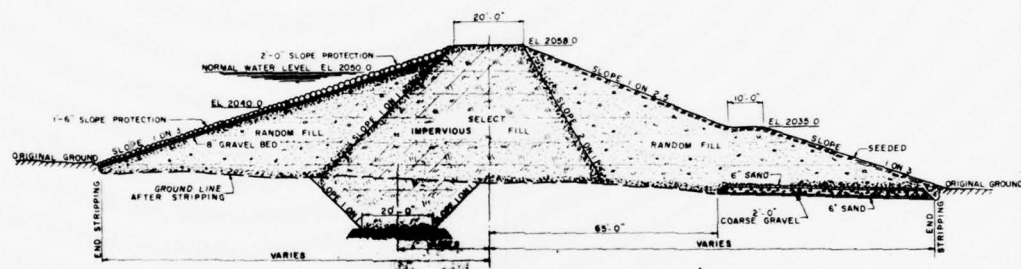


DIAGRAM OF CAMBER FOR CREST OF DAM

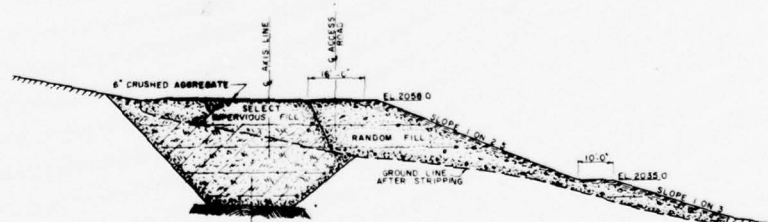
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HOR 1"=50'
VERT 1"=2'



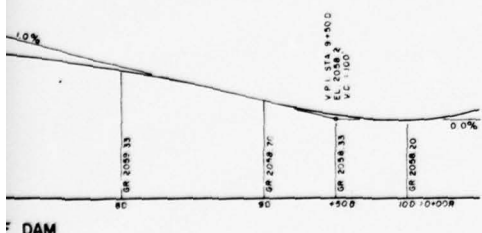
TYPICAL CROSS SECTION
STATION 5+60D TO STATION 7+00D
SCALE 1" = 20'



TYPICAL CROSS SECTION
STATION 4+00D TO STATION 4+50D
STATION 7+00D TO STATION 8+00D
SCALE 1" = 20'

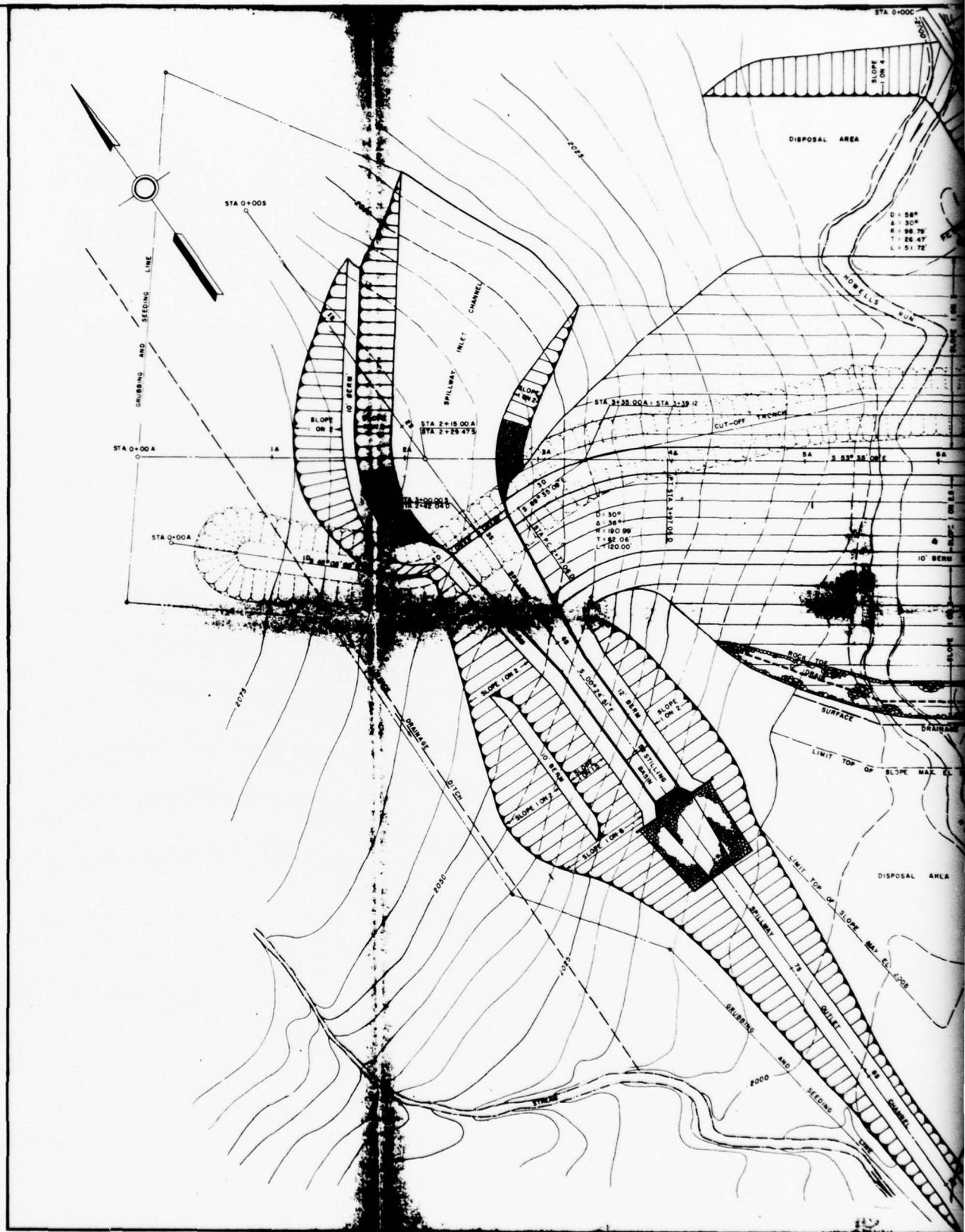


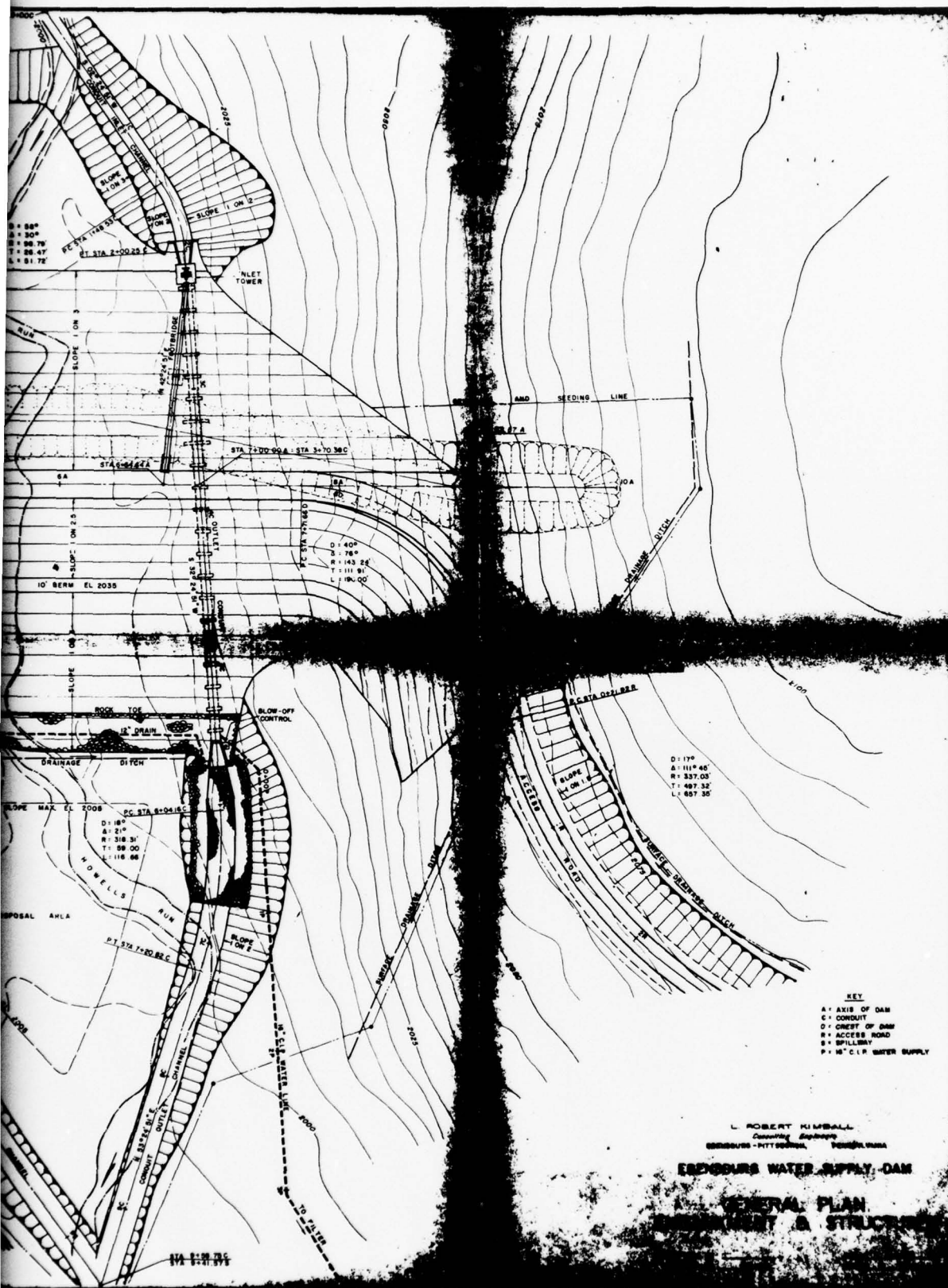
CROSS SECTION
RADIAL TO ACCESS ROAD
AT STATION 8+50D
SCALE 1" = 20'



L. ROBERT HINDBALL
Consulting Engineers
EBENSBURG - PITTSBURGH, PENNSYLVANIA
EBENSBURG WATER SUPPLY DAM
EMBANKMENT SECTIONS

APPROVED BY _____
CODE NUMBER 459-28
SCALE AS SHOWN
SHEET 11 OF 34





KEY
 A - AXIS OF DAM
 C - CREST OF DAM
 O - ORIGIN OF DAM
 R - ACCESS ROAD
 S - SPILLWAY
 P - 16" C.I.P. WATER SUPPLY

L. ROBERT KIMBALL
 Consulting Engineer
 1000 - PITTSBURGH, PENNSYLVANIA
ERIDOUR WATER SUPPLY DAM
GENERAL PLAN
FOUNDATION & STRUCTURE

PLATE 2

D'APPOLONIA²

DRAWN BY	G.J.G.	CHECKED BY	JHP	6-2-73	DRAWING NUMBER	76-114-B37
	5-25-78	APPROVED BY		6/2/73		

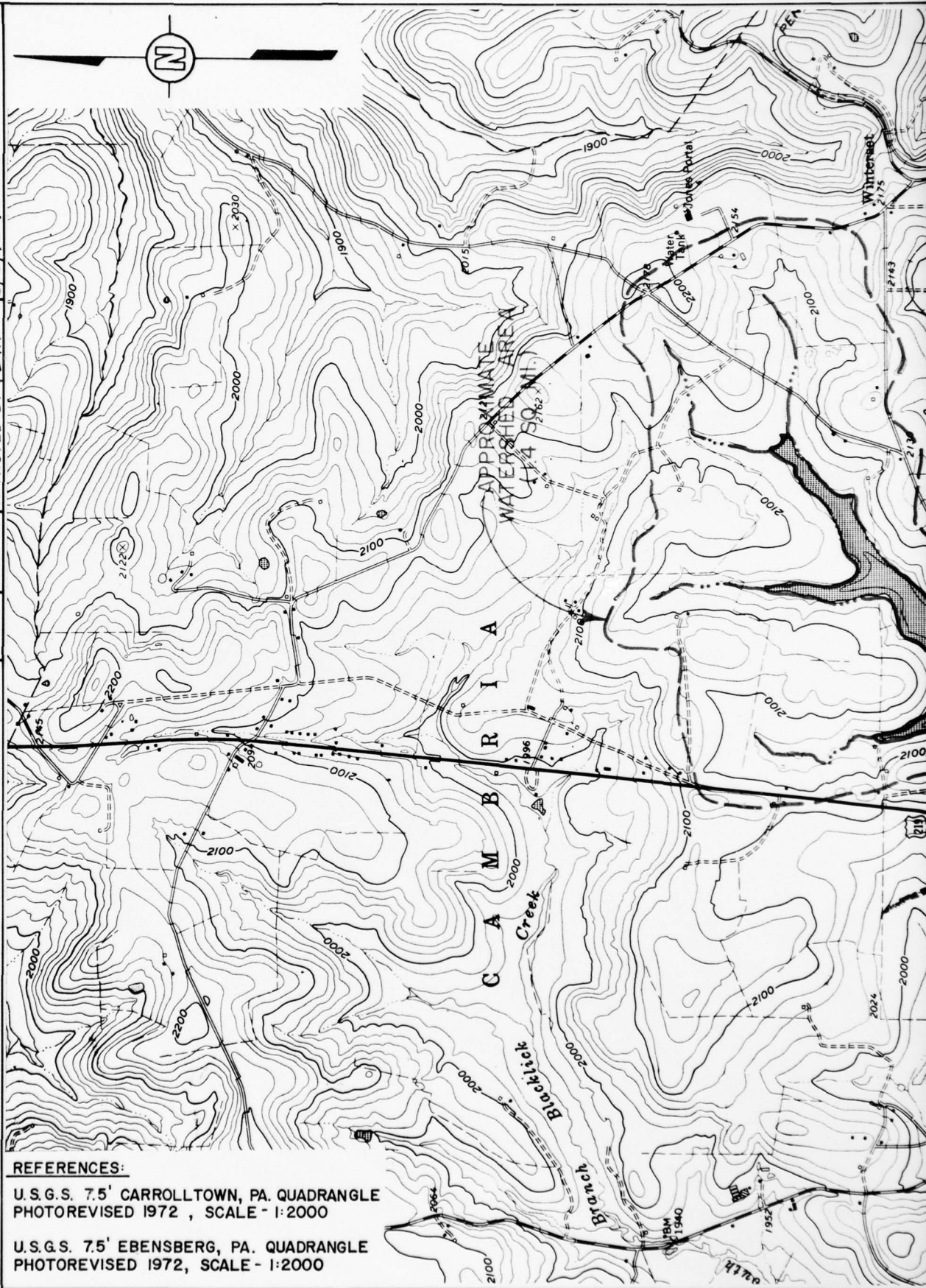


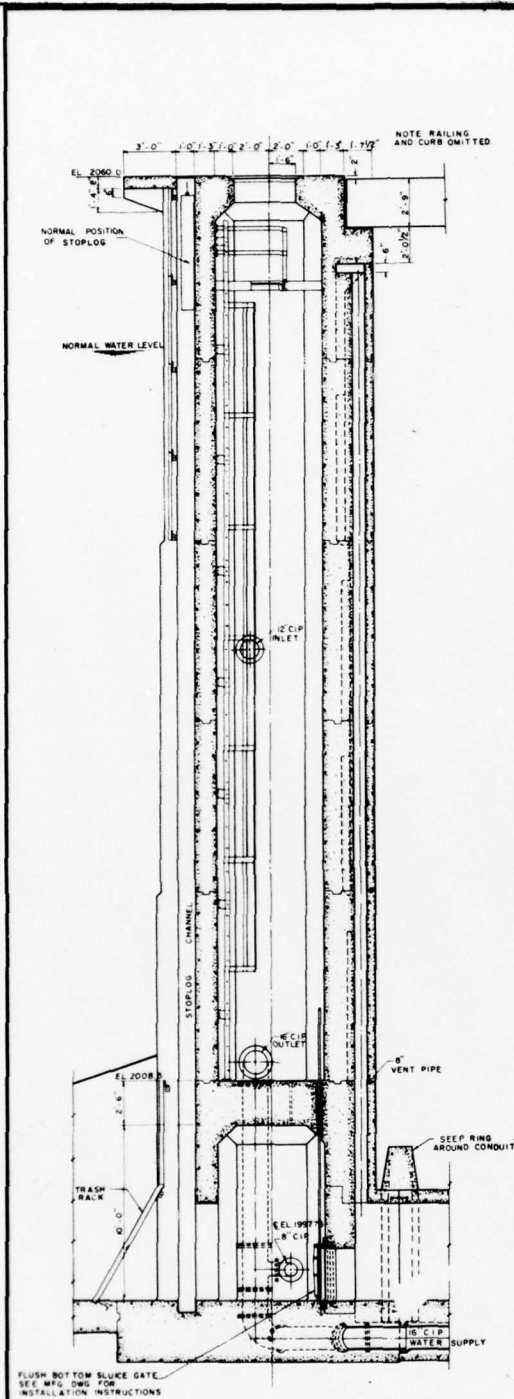


PLATE 3

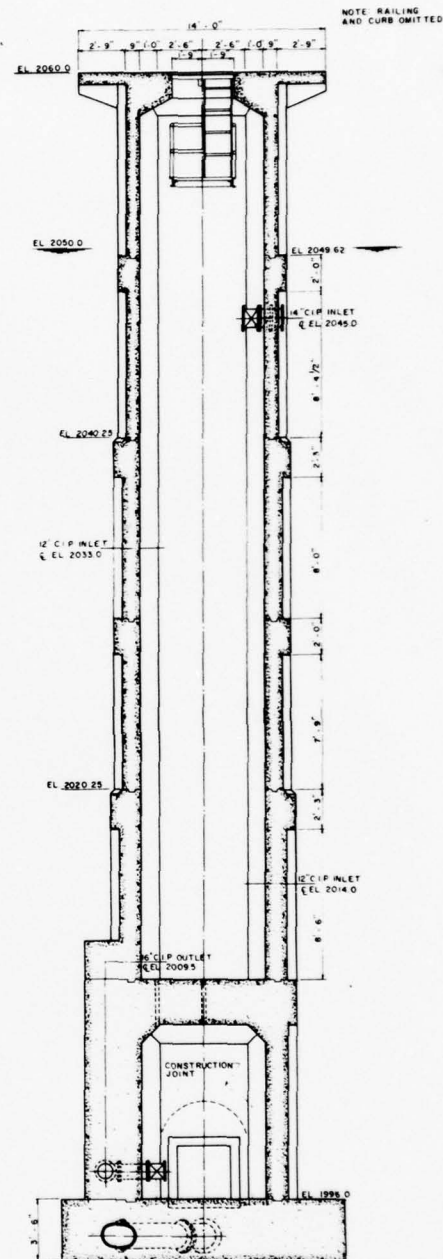
HOWELLS RUN DAM
VICINITY, FLOOD PLAIN AND
WATERSHED MAP

D'APPOLONIA

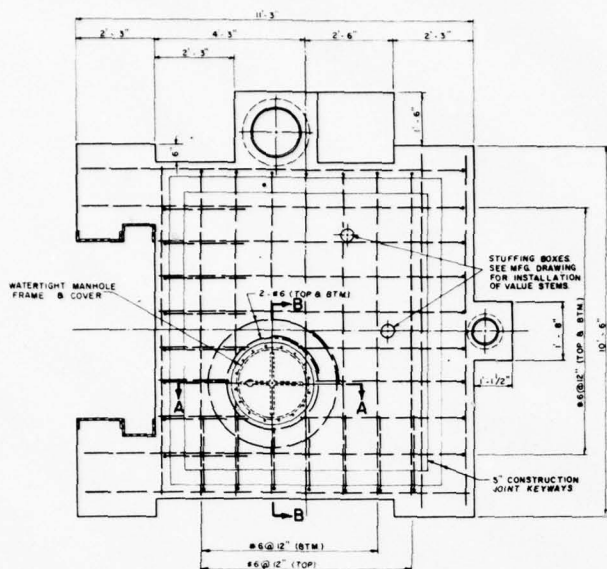
DRAWN BY	RGH	CHECKED BY	136	DRAWING NUMBER	78-14-B34
BY	5-25-78	APPROVED BY	JHP		6-2-78
					6/2/78



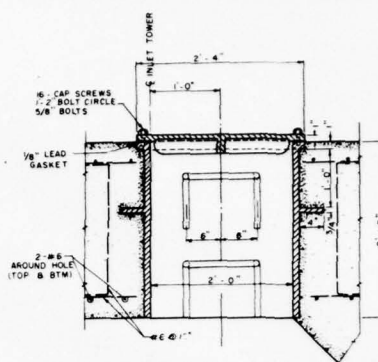
SECTIONAL ELEVATION
SCALE 1/4" = 1'-0"



SECTIONAL ELEVATION
SCALE 1/4" = 1'-0"

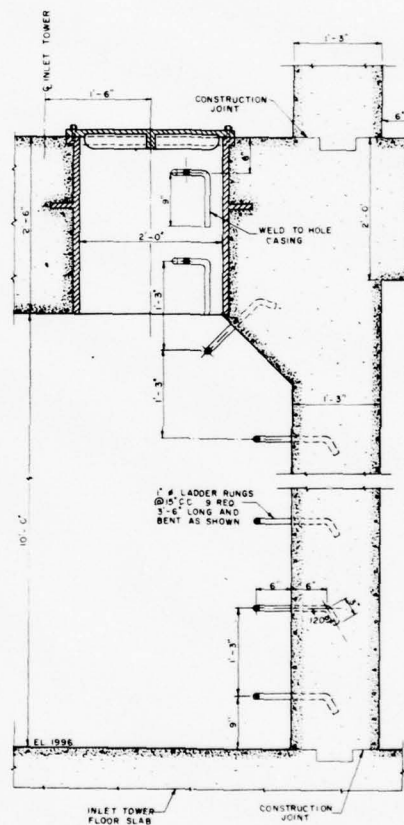


CROSS SECTION AT ELEVATION 2008.5
SCALE 1/2" = 1' - 0"



SECTION A-A

SCALE 1" = 1'-0"



SECTION B - B

SCALE 1" = 1' - 0"

L ROBERT KIMBALL

Consulting Engineers
EBENSBURG - PITTSBURGH PENNSYLVANIA

EBENSBURG WATER SUPPLY DAM

INLET TOWER DETAILS

APPROVED BY _____
CODE NUMBER 458-28

SCALE AS SHOWN
SHEET 18 OF 34

SECTIONAL ELEVATION

SCALE $\frac{1}{2}'' = 1' - 0''$

PLATE 4

D'APPOLONIA

DRAWN BY	RGH	CHECKED BY	BE	DATE	6-2-78	DRAWING NUMBER	78-14-A10
		APPROVED BY	JHP		6/2/78		

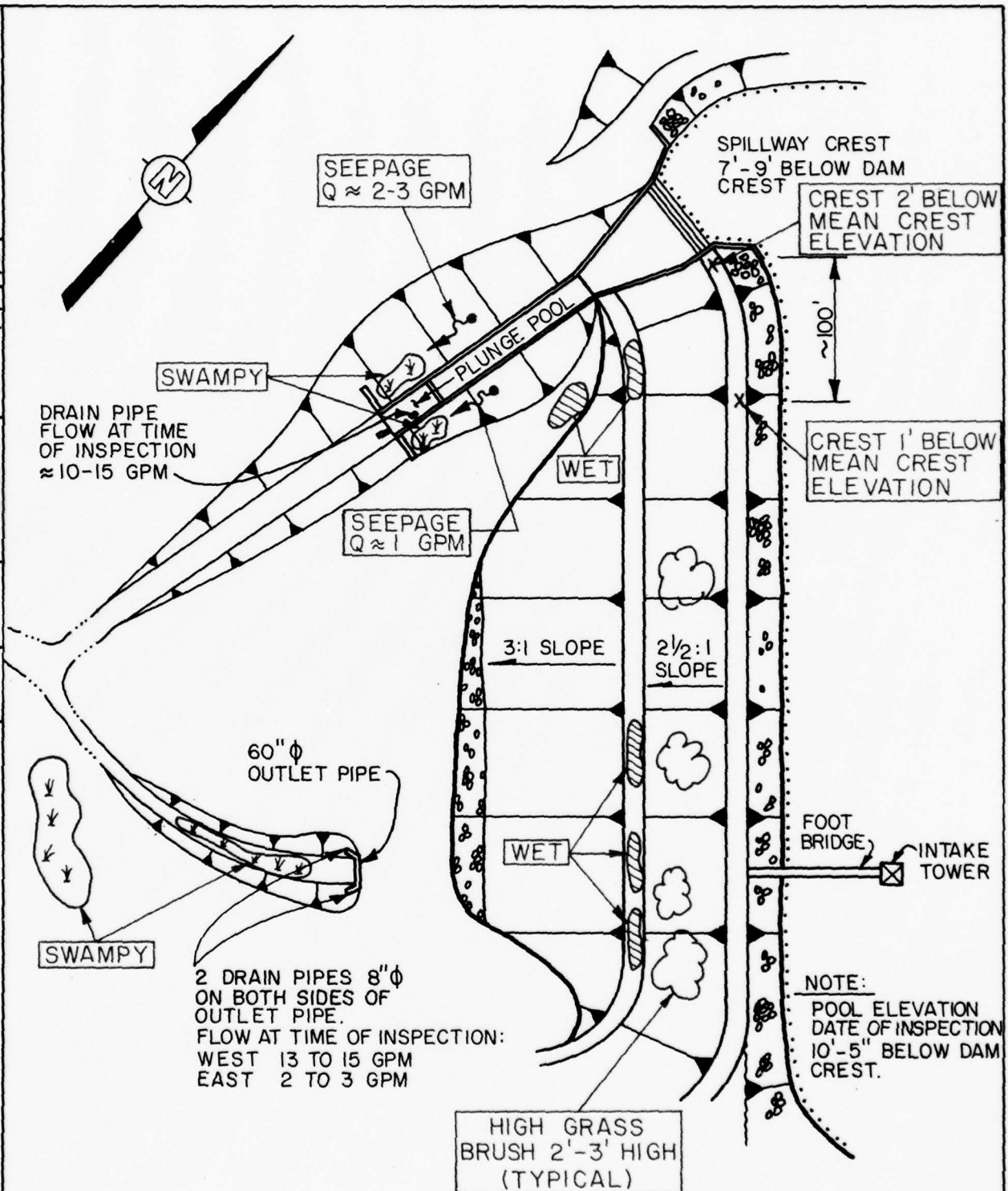


PLATE 5

HOWELLS RUN DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: MAY 16, 1978

D'APPOLONIA

NOT TO SCALE

APPENDIX A
CHECKLIST, VISUAL INSPECTION
PHASE I

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM HOWELLS RUN DAM COUNTY CAMPBELL STATE PA. ID# NDS:434
 TYPE OF DAM EARTH FILL HAZARD CATEGORY HIGH DER: 11-103
 DATE(S) INSPECTION MAY 16, 1978 WEATHER PT. CLOUDY TEMPERATURE 70'S
 POOL ELEVATION AT TIME OF INSPECTION 2050 M.S.L. TAILWATER AT TIME OF INSPECTION 1990 M.S.L.

INSPECTION PERSONNEL:

<u>BILGIN EREL</u>	<u>REVIEW INSPECTION BY</u>	<u>ELC D'APOLONIA.</u>
<u>W.T. CHAN</u>	<u>(MAY 30, 1978)</u>	<u>LAWRENCE ANDERSEN</u>
		<u>JAMES DOELST.</u>

BILGIN EREL RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

NAME OF DAM HOWELLS EUN DAM
ID# NDS: 434 DER: 11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE FOUND	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE FOUND	
SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	NONE FOUND.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	HORIZONTAL: NO PERCEIVABLE MISALIGNMENT VERTICAL: APPROXIMATELY 2-FT CROWN	
RIPRAP FAILURES	NONE FOUND.	

VISUAL INSPECTION
PHASE I
EMBANKMENT

NAME OF DAM HOWERS RUN J
ID# NLS:434 DEP:11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	CONCENTRATED SEEP ON EACH SIDE OF SPILLWAY GUTE.	SEE PLATE 5
ANY NOTICEABLE SEEPAGE	SOME WET AREAS ON DOWNSTREAM SLOPE BENCH.	SEE PLATE -5
STAFF GAGE AND RECORDER	NONE FOUND.	
DRAINS	THREE DRAINS LOCATED ONE DISCHARGING INTO THE SPILLWAY PLUNGE POOL. TWO DRAINS ON BOTH SIDS OF DRAIN PIPE	SEE PLATE -5.

VISUAL INSPECTION
 PHASE 1
 CONCRETE/MASONRY DAMS

NAME OF DAM HOWEELS RUN
 ID# NDS: 434 DER: 11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	(EARTH FILL DAM) N/A.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A.	
DRAINS	N/A.	
WATER PASSAGES	N/A.	
FOUNDATION	N/A.	

VISUAL INSPECTION
PHASE I
CONCRETE/MASONRY DAMS

NAME OF DAM HOWELLS RUN DAM
ID# 1155-434 11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	EARTH FILL DAM N/A.	
STRUCTURAL CRACKING	N/A.	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A.	
MONOLITH JOINTS	N/A.	
CONSTRUCTION JOINTS	N/A.	
STAFF GAGE OF RECORDER:	N/A.	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

NAME OF DAM HOWELL EUN DAM
ID# HLC: 434 LEP: 11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	ONLY OUTLET END VISIBLE, NONE FOUND.	
INTAKE STRUCTURE	SUBMERGED.	
OUTLET STRUCTURE	NO OUTLET STRUCTURE.	
OUTLET CHANNEL	RIPPED TRAPEZOIDAL CHANNEL.	
EMERGENCY GATE	OPERATION <u>NOT</u> OBSERVED. BOBROUGH PERSONNEL REPORTED THAT BEST TO THEIR KNOWLEDGE IT HAS NEVER BEEN OPERATED.	

VISUAL INSPECTION
 PHASE I
 UNGATED SPILLWAY

NAME OF DAM HOWELLS RUN DAM

ID# NDS: 434 DER: 11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	GOOD CONDITION	
APPROACH CHANNEL	LAKE.	
DISCHARGE CHANNEL	MINOR STRUCTURAL CRACKS.	
BRIDGE AND PIERS	NONE.	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

NAME OF DAM HOWELLS RUN DAM
ID# 11-5: 434 DATE: 11-12-83

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	NO GATED SPILLWAY N/A.	
APPROACH CHANNEL	N/A.	
DISCHARGE CHANNEL	N/A.	
BRIDGE PIERS	N/A.	
GATES AND OPERATION EQUIPMENT	N/A.	

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

NAME OF DAM HOWELL'S RUN DAM

ID# NDS: 434 EXP: 11-10-83

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE FOUND	
OBSERVATION WELLS	NONE FOUND	
WEIRS	TRIANGULAR SHARP POINTED WEIRS WERE INSTALLED TO THE DISCHARGE END OF THREE DRAIN PIPES.	SEE PLATE 5 FOR LOCATION AND THE DISCHARGES ON THE DATE OF INSPECTION.
PIEZOMETERS	NONE FOUND	
OTHER	NONE	

VISUAL INSPECTION
PHASE I
RESERVOIR

NAME OF DAM HOWELLS RUN DAM
ID# NDS:424 DEP: 11-103

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	GENTLE. NO INDICATION OF HIGH SHORCLINE EROSION.	
SEDIMENTATION	LAKE IS CLEAR NO INDICATION OF HIGH RATE OF SEDIMENT ACCUMULATION.	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

NAME OF DAM HOWEELLS RUN DAM
ID# NLS: 424 DEC 11-103

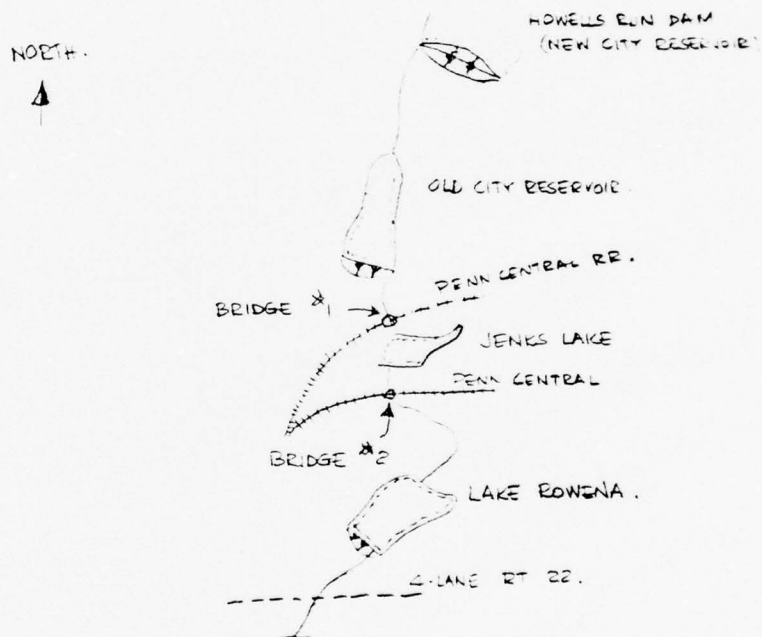
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	STREAM FLOWS THROUGH THREE RESERVOIR IN A DISTANCE OF ABOUT A MILE DOWNSTREAM FROM THE DAM.	
SLOPES		
APPROXIMATE NUMBER OF HOMES AND POPULATION	EVERGREENS WATER TREATMENT PLANT, IS HOMES SEVERAL COMMERCIAL BUILDINGS POPULATION: ~100	

D'APOLONIA

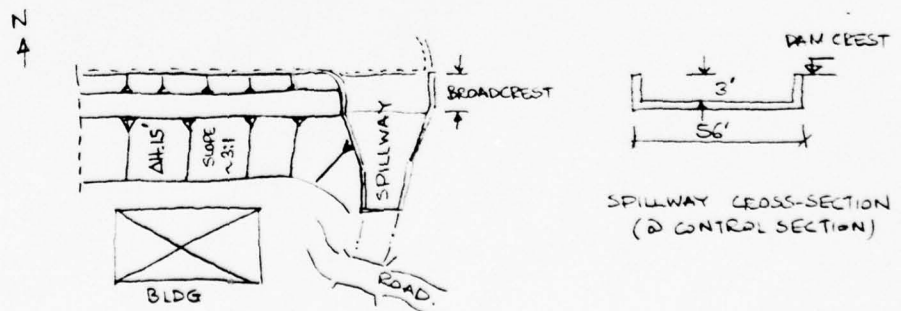
CONSULTING ENGINEERS, INC

By BE Date 5-16-78 Subject HOWELLS RUN DAM NDC: 434 Sheet No 1 of 2
Chkd. By WTC Date 5-16-78 NEW CITY RESERVOIR - FIELD INS. SKETCH Proj. No 75-114-3

DOWNSTREAM IMPOUNDMENT & BRIDGES :- (IMMEDIATE DAMAGE REACH)



OLD CITY RESERVOIR SPILLWAY

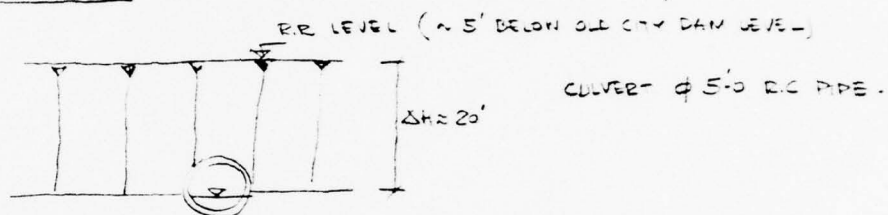


D'APOLONIA

CONSULTING ENGINEERS, INC.

By BE Date 5-16-78 Subject HONELL'S RUN DAM NDS: 434 Sheet No 2 of 2
 Chkd. By WTC Date 5-16-78 (NEW CITY RESERVOIR) - FIELD INS SKETCH. Proj. No 78-114-13

BRIDGE #1 (CULVERT UNDER R.R. EMBANKMENT)



JENES LAKE : HEIGHT OF EMBANKMENT $\approx 4'$
 SPILLWAY : 150 FT NDE, 4-FT DEEP.

BRIDGE #2 (CULVERT UNDER R.R. EMBANKMENT)



LAKE COWENA SPILLWAY



APPENDIX B
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM HOWELLS RUN DAM
ID# INDS:434 DEP: 11-103

ITEM	REMARKS
AS-BUILT DRAWINGS	DESIGN DRAWING ARE AVAILABLE IN DER FILES.
REGIONAL VICINITY MAP	SEE PLATE - 3
CONSTRUCTION HISTORY	COMPLETED IN 1964. FURTHER INFORMATION ARE INCLUDED IN CONSTRUCTION PROGRESS REPORT IN DER FILES.
TYPICAL SECTIONS OF DAM	SEE PLATE - 1
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATING	SEE PLATES 2 & 4

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM HOWELLS RUN DAM
ID# NDS:434 DER:11-103

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NOT AVAILABLE
DESIGN REPORTS	"ENGINEERING REPORT ON THE PROPOSED WATER SUPPLY DAM FOR THE BOROUGH OF EBENSBERG," PREPARED BY L.R. KIMBALL CONSULTING ENGINEERS. 1961
GEOLOGY REPORTS	INCLUDED IN ENGINEERING REPORT.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	RESULTS REPORTED IN ENGINEERING REPORT.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	BORING LOG. ARE ARE INCLUDED TO DESIGN DRAWINGS.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM HOWELLS RUN DAM

ID# NDS:434 DEC 11-103

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	NOT FOUND.
BORROW SOURCES	LAKE AREA, & SILLWAY CHANNEL EXCAVATION
MONITORING SYSTEMS	THREE TRIANGULAR WEIRS ARE AVAILABLE & FUNCTIONING TO MONITOR SEEPAGE FLOWS.
MODIFICATIONS	1964 DRAIN PIPE WAS EXTENDED BY 150 FT IN DOWNSTREAM DIRECTION. AN EARTHFUL BUTRESS WAS PLACED AGAINST A SLIDE AREA ON THE LEFT SIDE OF OUTLET PIPE.
HIGH POOL RECORDS	NOT AVAILABLE

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM HOWELLS RUN DAM
ID# NDS:434 PER 11-103

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	THE LANDSLIDE ON THE LEFT ABUTMENT IN 1964 WAS STUDIED BY F.T. KITLINSKI AND ASSOCIATES CONSULTING ENGINEERS OF HARRISBURG. VARIOUS LETTER REPORTS ARE INCLUDED IN DER FILES.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	NONE REPORTED.
MAINTENANCE OPERATION RECORDS	NOT AVAILABLE.
SPILLWAY PLAN SECTIONS DETAILS	SEE PLATE - 2 DETAILS ARE IN DER FILES
OPERATING EQUIPMENT PLANS AND DETAILS	INCLUDED IN DESIGN DRAWINGS.

NAME OF DAM HONEYS RUN DAM

ID# NDS: 434 DER: 11-103

CHECKLIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: WOODED (1.4 SQ. MILES)
ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 1324 ACRE-FEET @ EL 2050
ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: SAME AS ABOVE
ELEVATION; MAXIMUM DESIGN POOL: 2050 FT (AS DESIGNED) U.S.G.S DATUM.
ELEVATION; TOP DAM: 2058 FT (AS DESIGNED) USGS DATUM,

CREST:

- a. Elevation 2058 FT
- b. Type EARTH.
- c. Width 20 FT.
- d. Length 670 FT
- e. Location Spillover 100 FT OF CREST LEFT OF SPILLWAY
- f. Number and Type of Gates NO GATE ON SPILLWAY

OUTLET WORKS:

- a. Type REINFORCED CONCRETE DRAIN CONDUIT.
- b. Location NEAR LEFT ABUTMENT
- c. Entrance Inverts 1996 FT.
- d. Exit Inverts 1986 FT (ESTIMATED)
- e. Emergency Draindown Facilities DRAIN CONDUIT.

HYDROMETEOROLOGICAL GAGES:

- a. Type NONE
- b. Location NONE
- c. Records NONE

MAXIMUM NONDAMAGING DISCHARGE: MAX SPILLWAY DISCHARGE ~ 2750 CFS.

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
HOWELLS RUN DAM
NDS I.D. NO. 434
MAY 16, 1978

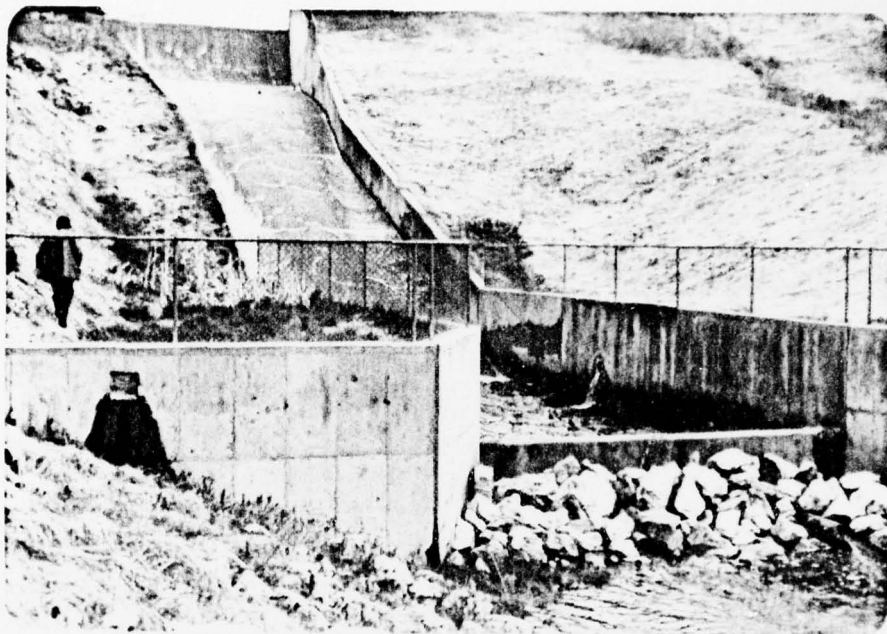
<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Dam crest.
2	Right abutment, spillway, and discharge channel.
3	Plunge pool.
4	Spillway approach channel.
5	Outlet pipe and toe drainpipes.
6	Seepage at the right abutment.
7	Old city reservoir spillway 0.6 mile downstream.
8	Five-foot-diameter railroad culvert 0.7 mile downstream.
9	Lake Jenks spillway 0.8 mile downstream.
10	Two 9-foot-diameter railroad culverts 0.9 mile downstream.
11	Lake Rowena 1.5 miles downstream.
12	Lake Rowena spillway and outlet pipe.



Photograph No. 1
Dam crest.



Photograph No. 2
Right abutment, spillway, and discharge channel.



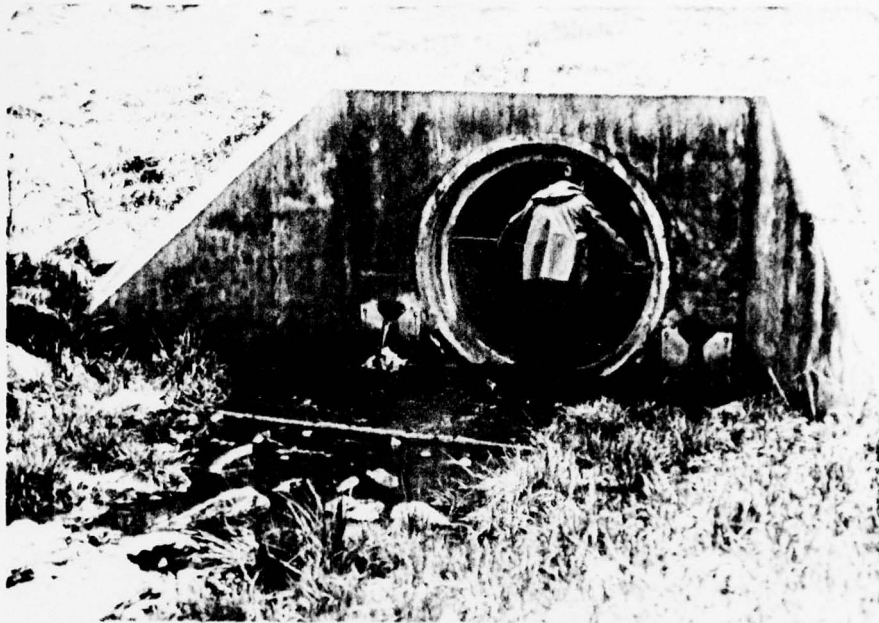
Photograph No. 3

Plunge pool.



Photograph No. 4

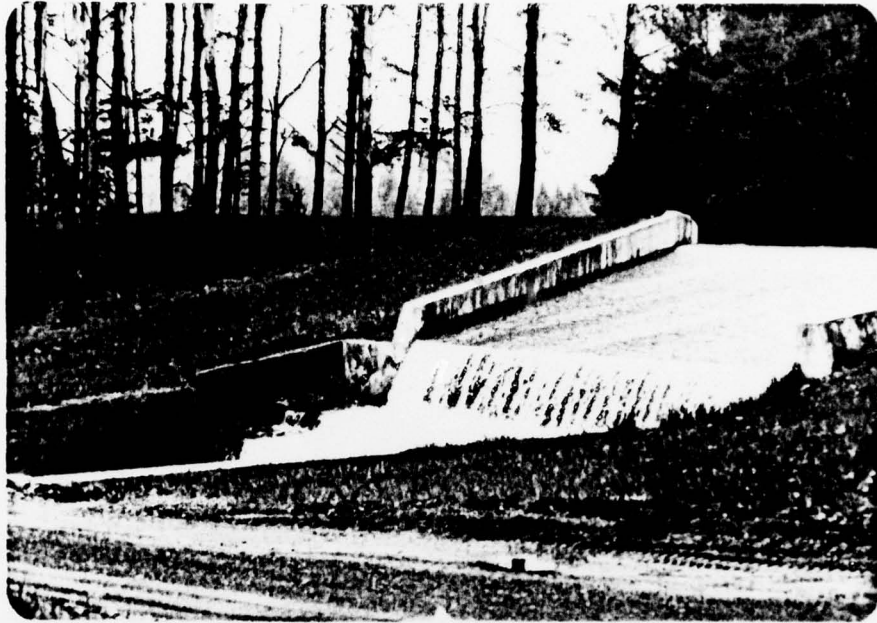
Spillway approach channel.



Photograph No. 5
Outlet pipe and toe drainpipes.



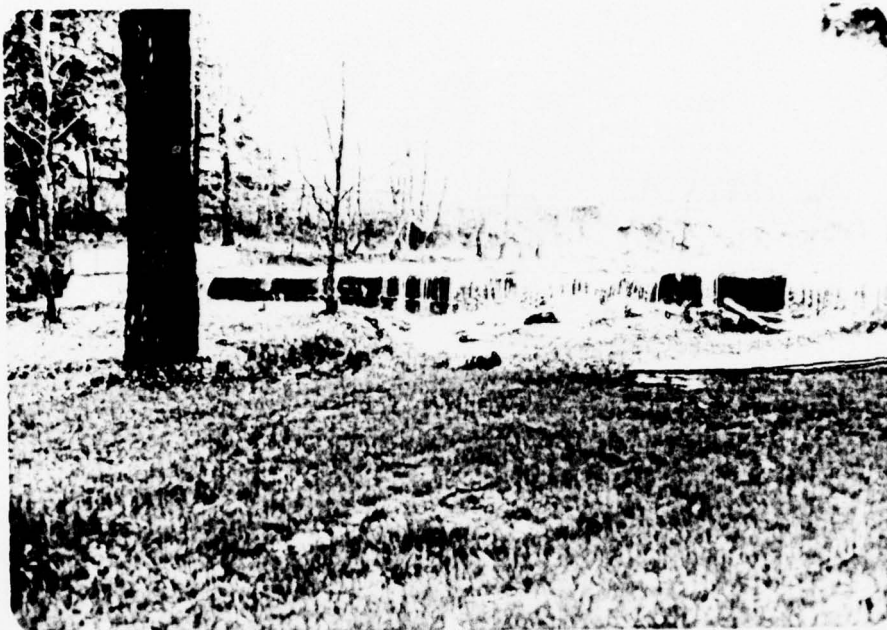
Photograph No. 6
Seepage at the right abutment.



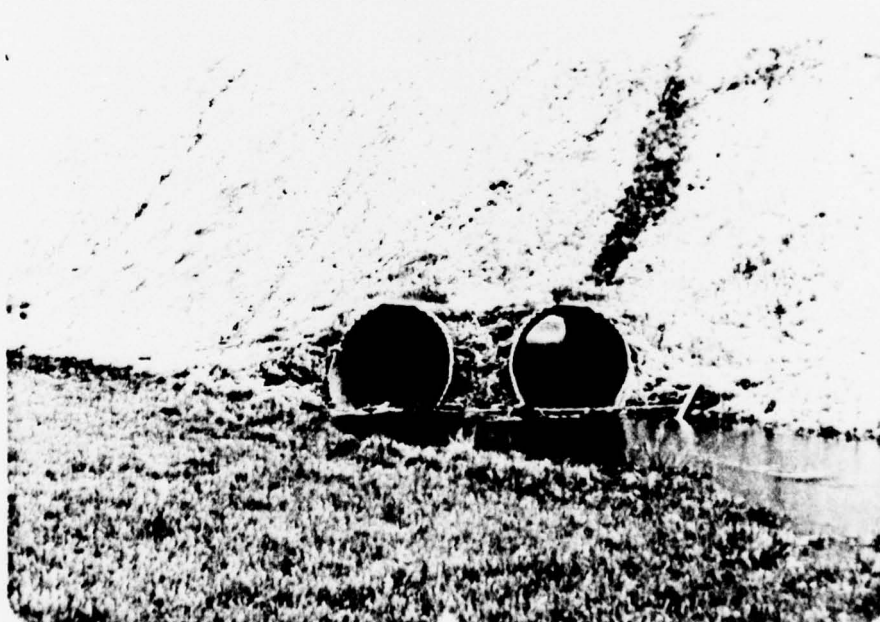
Photograph No. 7
Old city reservoir spillway 0.6 mile downstream.



Photograph No. 8
Five-foot-diameter railroad culvert 0.7 mile downstream.



Photograph No. 9
Lake Jenks spillway 0.8 mile downstream.



Photograph No. 10
Two 9-foot-diameter railroad culverts 0.9 mile downstream.



Photograph No. 11
Lake Rowena 1.5 miles downstream.



Photograph No. 12
Lake Rowena spillway and outlet pipe.

APPENDIX D
CALCULATIONS

DAI POLONIA

CONSULTING ENGINEERS, INC.

By WTC Date 5-22-78 Subject HOWELL'S RUN DAM Sheet No. 1 of 2
 Chkd. By EA Date 6-1-78 HYDROLOGY & HYDRAULIC Proj. No. 75-14-13

DAM : HOWELL'S RUN DAM (NEW EBENSBURG CITY RESERVOIR)

WATERSHED AREA, $A = 1.40$ SQ MILES

INFLOW HYDROGRAPH : BASIN OHIO RIVER BASIN — HOWELL'S RUN,
 TRIBUTARY OF NORTH BRANCH LITTLE CONEHAUGH
 RIVER.

TOTAL TIME, $T_s = 32$ HOUR

PMF PEAK FLOW, $q_p = 1900$ cfs/SQ. MILES

PMF PEAK FLOW $Q_p = q_p A = 1900 \times 1.4$
 $= 2660$ cfs

VOLUME OF INFLOW $= V_i = \frac{1}{2} (T \times 3600) \times Q$
 $= \frac{1}{2} (32 \times 3600) (2660)$
 $= 153.2 \times 10^6$ CF
 $= 153.2$ MCF
 ≈ 3500 ACRE-FT
 \hookrightarrow EQUAL TO 47.1" DIAM. OFF

SPILLWAY CAPACITY

TYPE CONCRETE OGEE WEIR W/ CHUTE SPILLWAY & STILLING
 BASIN, APPROACHING CHANNEL — LAKE

CREST WEIR LENGTH = 50 FT

HEAD (max) $h = 2058$ (DAM CREST) — 2050 (Spillway
 crest)
 $= 8$ FT

$$Q_s = (3.6)(50)(H)^{1.5}$$

FOR $Q_s = 2660 \Rightarrow H = 6.02$ FT

APPROACHING $V = \frac{2660}{(50)(6+5)} = 4.84$ fps



DIAPOLONA
CONSULTING ENGINEERS, INC.

By WTC Date 5-22-78 Subject HOWELL'S RUN DAM Sheet No. 2 of 2
Chkd. By EL Date 6-1-78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-13

$$\text{VELOCITY HEAD} = \frac{V^2}{2g} = \frac{4.84^2}{64.4} = 0.36 \text{ FT}$$

$$\text{REQ'D TOTAL HEAD} = 6.02 + 0.36 = 6.38 \text{ FT}$$

$$\text{OR RESERVOIR WATER LEVEL} = 2050 + 6.38 \\ \text{EL } 2056.38$$

AVAILABLE HEAD

DAM CREST EL 2058

SPILLWAY EL 2050

W.L. EL 2056.38 (FOR PMF)

FREEBOARD 1.62 FT (FOR PMF)

CONCLUSION: THE SPILLWAY IS ADEQUATE FOR PMF
DESIGN STORM

MAX. SPILLWAY (AS DESIGNED BY KIMBALL) CAPACITY = 2750 ^{cfs} @ EL 2055.7

TAILWATER DEPTH

REVIEW, L. ROBERT KIMBALL CONSULTING ENGR'S
"ENGINEERING REPORT ON THE PROPOSED
WATER SUPPLY DAM FOR THE BOROUGH
OF EBENSBURG, CAMBRIA COUNTY, PA"
1961

THE TAILWATER DEPTH FOR PMF IS 6.0' + ABOVE stream bed
(EL 2082) FOR SECTION A-A

APPENDIX E
REGIONAL GEOLOGY

APPENDIX E REGIONAL GEOLOGY

A preliminary review of existing geologic information indicates that the site is located approximately two miles west of the Allegheny Front, on the east limb of the Wilmore Syncline. Dip of the strata averages five degrees to the northwest towards the Wilmore Syncline. Rocks at the site belong to the Allegheny and Pottsville Formations of the Pennsylvanian System. The Allegheny Group is composed of sandstones, shales, thin limestones, and several coal seams. The most important coals in the dam site area are the Lower Freeport and the Upper and Lower Kittanning. The Pottsville Group underlies the Allegheny and is composed of the Homewood Sandstone, Mercer Shale, and the Conoquessing Sandstone.

Deep mining of the Lower Kittanning Coal has taken place beneath portions of the valley and the hogback near the dam.